Name _____

Date _____

Monohybrid Genetics with Corn

Background Knowledge

In these activities, you will investigate phenotypes of corn that are expressed in the seed. You will be given ears of corn for your investigation. Each seed on an ear results from a separate fertilization event and thus represents an offspring. Further, the seeds on the ear are the F_2 from a cross that began with two parental varieties of corn with contrasting phenotypes.

To successfully complete these activities, you must have a good background knowledge of genetics. On a sheet of notebook paper, write the things you know about genetics that you think will help you complete these activities. Include at least six different facts that you know about genetics and explain how this knowledge will help you. Here are some questions to help you get started, but do not be limited by these questions. Keep the paper as a reference during the rest of this lab. Add notes and make modifications as needed.

1. What are homologous chromosomes and what do they have to do with genes and alleles?
2. What are gametes?
3. What is a phenotype? What is a genotype?
4. How will I know which allele is dominant? How will I know which allele is recessive?
5. What is a Punnett square? How is a Punnett square used?
6. How will I know what the F_2 seeds will look like? What phenotype ratio will I expect in the F_2?

Exercise A: Parental Cross and F_1

You will be given a Corn Parental Cross Card that shows a cross of two parental varieties of corn with contrasting phenotypes, and the F_1 corn resulting from the cross. P_1 and P_2 designate the parents of this cross, and F_1 (first *filial*, a word that refers to siblings) designates their offspring.

The parental corn varieties are homozygous for the genotypes you will be studying.

Examine the cross that is shown on your Corn Parental Cross Card and complete the following activities and questions.

1. Decide on a one-word description of the phenotype of each of your P_1 corn varieties and record them here.

   Phenotype _____

   Phenotype _____

2. Decide what symbols you will use to represent the alleles by which these phenotypes are inherited. Record the symbols here.

_____ is the symbol for the allele _____

_____ is the symbol for the allele _____

3. Which allele is dominant? Explain how you know.

_____

_____

_____

_____

4. What is the genotype of the F_1? _____

5. Using the information you recorded above and your knowledge of genetics, draw in the space below a Punnett square showing the results of crossing the F_1 to obtain an F_2.

6. From your completed Punnett square, give the phenotypes and their expected ratios for the F_2.

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7. State, as completely as you can, your hypothesis about the inheritance of the phenotypes. Using your hypothesis, predict what you expect to find in the F_2.

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Exercise B: Investigating the F_2

You will now test your hypothesis and prediction made in 7, above. Your teacher will give you an F_2 ear of corn from the cross you diagramed above. Working in pairs, count and record in Table 1 the number of grains of each phenotype. One person should call out the phenotypes while the other records them in the table.

To make the count, mark the beginning of one row of grains and count and record the phenotypes of each grain in that row. Continue counting, marking the beginning of each row as you count.

When finished counting, total your results. Then obtain and record the class totals.

Table 1: F_2 Phenotype Count for _____ × _____

Phenotype		
Team Count		
	Total	Total
	Team total for all phenotypes counted	
Class Count	Total	Total
	Class total for all phenotypes counted	

8. How do the Class Counts in Table 1 compare to the expected counts for this cross? You can determine the expected counts using the phenotype ratios you recorded in 6 above. Let us suppose you determined that there would be 3 of phenotype A for every 1 of phenotype B (a 3:1 ratio), and the Class Total for all phenotypes counted is 1,000. Because the total of 3 + 1 is 4, we first determine 1/4 of the total for all phenotypes: 1,000 ÷ 4 = 250 (rounded to the nearest whole). We can now calculate the expected counts as 3(250) = 750 for phenotype A and 1(250) = 250 for phenotype B. Use your phenotype ratios from 6 above and the Class Total for all phenotypes counted from Table 1 to calculate the expected counts for your cross, and record them here.

   Phenotype _____ expected count _____

   Phenotype _____ expected count _____

9. Compare the class actual counts from Table 1 to your calculated expected counts. Are the actual counts different from the expected counts? If so, explain why.

   _____

   _____

   _____

   _____

10. Do these results tend to confirm or disprove your hypothesis as stated in 7, above? Explain your answer.

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Final Activity

Refer to the Background Knowledge sheet that you produced at the beginning of this lab. Make any needed additions, corrections, or deletions to it that you feel are necessary. Has your knowledge of genetics changed as a result of doing this lab? Explain your answer.

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